AN OGDEN PUBLICATION DEVOTED TO GLASS TECHNOLOGY, ENGINEERING, MATERIAL AND GLASS FACTORY EQUIPMENT AND OPERATION

the glass industry

9m.W

CONTENTS FOR JANUARY : 1944

Distincton not Definition—An Editorial 17

Research in Glass is Horizontal at Preston Laboratories 18

Specializing in technology pertaining to all types of glass, this laboratory's approach has been not through glass technology, but through mechanical engineering and basic physics. By Cyril B. Delgado.

Some Microanalytic Methods for the Investigation of Glass, Part II 21

The concluding installment of a paper outlining the desirability of microanalytic methods in examination of inhomogeneities as well as the determination of certain elements in glass.

The Mechanism of Glass Cutting, Part I 23

The first installment of a comprehensive discussion on the technical operations involved in the cutting of glass. A translation from Glastechnische Berichte.

Inventions and Inventors 26

Summary of U. S. Patents of Interest to the Glass Industry Issued During November.

Research Digest 28

Practical Interpretations of Glass Technology.

Current Statistics 29

Production, shipments and employment for the months of October and November.

Equipment and Supplies 32

SERIAL

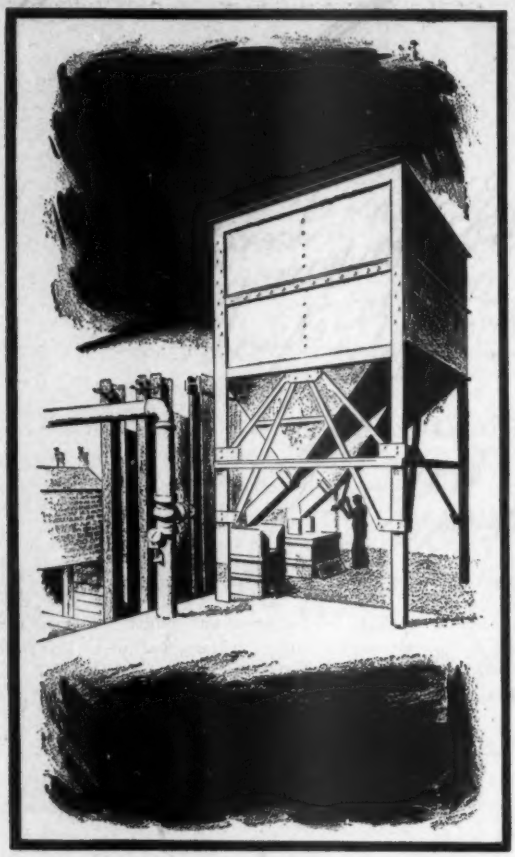
1944-1945
R 666.1 v.25-26
N. A.

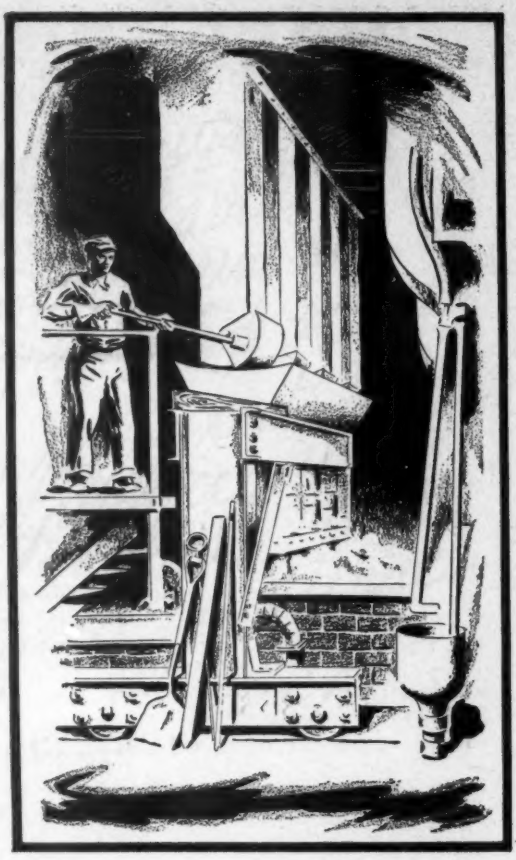
MAY 24 1946

Published by
OGDEN PUBLISHING COMPANY 55 WEST 42ND STREET, NEW YORK 18, N. Y.
JOHN T. OGDEN, Publisher
CYRIL B. DELGADO, Editor and Business Manager
AMADA SWANLUND, Editorial Assistant
Pacific Coast Representatives: J. W. CONROW & CO., 1672 Walworth Ave., Pasadena, California

Copyright, 1944, Ogden Publishing Co.

THE GLASS INDUSTRY, Vol. 25, No. 1, January, 1944. Published monthly by Ogden Publishing Company, at 55 West 42nd Street, New York 18, N. Y. Subscriptions $3.00 a year. Canada, $3.50. Foreign, $4.00. Single copies 25 cents domestic, 35 cents Canada and foreign. Issues over three months old 50 cents. Entered as second class matter, August 10, 1921, at the Post Office at New York, N. Y., under act of March 3, 1879.





Do Not Charge This Way . . . . BUT *Charge This Way for Quality Glass*

IF YOU want to make better glass with lower operating costs, use the SIMPLEX Blanket Method of Feeding the Raw Materials to your Tank Furnace, as shown above. • A SIMPLEX Representative can help you in this connection.

FRAZIER-SIMPLEX, INC.

ENGINEERS

436 EAST BEAU ST. WASHINGTON, PENNA., U.S.A.

THE GLASS INDUSTRY

VOLUME 25, NUMBER 1, JANUARY, 1944

Distinction Not Definition

AS reported in the December issue of THE GLASS INDUSTRY the protracted hearings before the Federal Trade Commission in the case of S. Buchsbaum and Company, manufacturer of Elasti-Glass, have resulted in a decision adverse to the plastic manufacturer.

The complaint issued, and subsequently served in January, 1941, by the Federal Trade Commission, charged the Buchsbaum company "with the use of unfair and deceptive acts and practices in commerce in violation of the provisions of the Federal Trade Commission Act." The Commission decreed such violation to exist by reason of the fact that through the use of the trade name Elasti-Glass and also through advertising, S. Buchsbaum and Company represented that its various products were made of glass whereas, in fact, its products are made from "a resinous material, a derivative of vinyl, which is sold under the trade name of Vinylite and to which a plasticizer has been added." In other words, Elasti-Glass is a plastic product – not glass.

The complaint was bitterly contested by the Buchsbaum company, not only with the usual legalistic forensics but through the introduction of technical testimony designed to offset similar technical evidence offered by the glass experts called by the Commission, namely, Doctors Hostetter, Morey and Ryan.

Despite the fact that the Commission's decision is a clear-cut victory for the glass industry in that it preserves the identity of glass as a material distinctly different in character and composition from that of plastics, and with full appreciation of the place of plastics in the scheme of things, it is not our purpose to gloat over this favorable quasi-legalistic governmental opinion, but rather to set down for the record the basis on which the Federal Trade Commission rendered its decision.

Much has appeared in this publication concerning the "definition of glass" and there will be more to follow, but it is a commentary on the Commission's sincerity of purpose in basing its findings and conclusion not so much on the technological evidence presented but on the practical and easily understood point of view of *the consuming public*—that body which the Commission in its complaint sought to protect.

This is revealed in paragraph four of the Commission's "Findings as to the Facts" which states, "Glass as understood and recognized by the general public is a hard, transparent, brittle material, with a relatively high softening point, and is substantially insoluble in water and organic solvents and is non-inflammable in the usual sense. This is the common glass found in window panes, tumblers, and bottles. For centuries this glass has been made with silica combined with soda and lime and is a product of fusion."

In spite of this approach, however, it should not be assumed that the Commission was unmindful of the technical phases of the controversy. That technical evidence did aid the FTC in reaching its decision is apparent in various parts of the Commission's findings, as for example in paragraph six which reads, "The plastic material used by the respondent in the manufacture of its products has none of the characteristics of glass as recognized and understood by the general public, other than that of transparency. It has a molding temperature of about 120 to 130° C., as compared to that of common glass, which is about 800 to 900° C. or higher. This material also differs from ordinary glass in that it does not have a high scratch hardness, low water absorption, or high softening and decomposition point."

Regardless of the extent to which technological evidence was considered, it is worthy of emphasis that despite all "definitions of glass" or plastics, glass has won its day in court not so much by *definition* as by *distinction*. A distinction based on its inherent properties and characteristics as understood by the "man in the street" —the glass industry's customers.

RESEARCH IN GLASS IS HORIZONTAL AT PRESTON LABORATORIES

Technological research at Butler embraces all types of glassware as well as scientific problems outside of the glass field

By CYRIL B. DELGADO

In the August 1938 issue of THE GLASS INDUSTRY there appeared an article describing the Preston Laboratories in Butler, Pennsylvania, outlining the activities in glass research carried on by a competent staff under the direction of Dr. Frank W. Preston. Since the publication of this original story many changes have taken place at the Laboratories; in personnel, scope of scientific research and the diversity of glass products for which research has been engaged in.

Original Laboratory Building: It houses most of the clerical force, a small drafting office, chemical laboratory, physics laboratory, standard testing procedure department and part of the machine shop. The upper floor is the caretaker's apartment.

Much has been printed in this publication and elsewhere on the work of the Preston Laboratories in the glass container field not only in actual technology but in broken bottle litigation where technical evidence evolved in the Laboratories was introduced in defense of the defendent glass manufacturers. Because of the preponderance of material published in connection with the glass container activities of the Preston Laboratories we recently visited Butler with a view to learning first hand just what other work the Laboratories do in the glass field. The visit was truly illuminating since it clearly revealed that Preston Laboratories are active not only in practically all other types of glass but engage in scientific research extending quite outside the field of glass.

Space limitations and other considerations prevent a minutely detailed account of the technical research carried on by the Preston staff, but a brief resume, as it applies to varied glass products, should be recorded just in case any misconception prevails that the Preston Laboratories are devoted exclusively to glass container research. A summary of the diversity of glass products which have been subjected to scientific study at the Butler Laboratories follows:

Wire Glass Manufacture: Breakage under service conditions leading to the development of new and improved methods and apparatus for the production of stronger structural sections of rolled glass, and the study of heat and light transmission problems involved in the use of wire glass.

Window Glass: Annealing problems with the Fourcault Process. Devitrification problems, especially with tinted and colored glasses made by the Fourcault method and an investigation of the causes of "carbon lines" and other optical heterogeneities with a view to their elimination.

Plate Glass: Grinding and polishing problems; machinery design and plant layout, breakage problems.

Table Ware: Development of static and impact testing methods of breakage; the effect of heat treatments on durability; study of the influences of manufacturing processes on strength; analysis of the significance of existing testing specifications and design as a factor in strength.

Glass Fibers: Development of structural elements to make use of the high tensile strength of glass fibers; the practical utilization of glass fibers and plastic combinations; mathematical theory of lightweighting for airplane structures; analysis of available natural and synthetic materials combining light weight and high strength; biological analogies in lightweighting.

Scientific Glassware: Methods of determining serviceability of glass seals in X-ray and electronic tubes.

Glass Blocks: Design of larger glass blocks with the view to improving resistance against the partial internal vacuum.

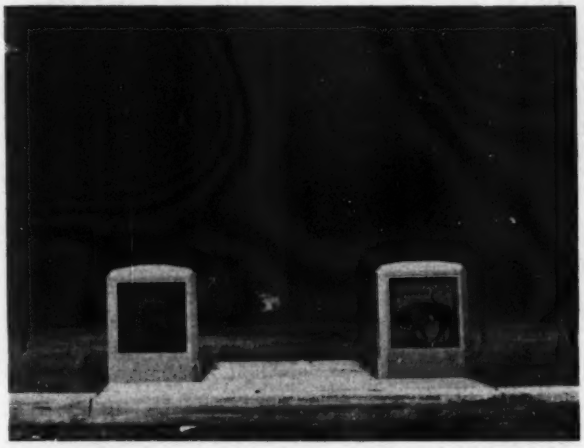
Glass Containers: Research on glass containers falls into two categories; that with which the container manufacturer is directly interested and can control and that which concerns proper use and methods of handling glass containers by the users. Research as it affects the first phase of container work includes design of bottles for maximum efficiency, "the lightweighting program" and the effect of heterogeneity upon strength (cord research). The Laboratories' activities as they pertain to users' problems include improvements in users' methods

The Pilot Plant houses development work which has progressed beyond the accommodations of the original laboratory building.

of handling and mistakes in domestic use and in bottle plants. One phase of container research which has been invaluable both tc the glass manufacturer and the bottler is the serious effect of internal damage to strength, and a broad educational program has been developed for the bottler on this particular factor and other abuses to which containers are often subjected by the user. In connection with container research an important part of the over-all program is the devising of appropriate tests and provision of suitable and efficient apparatus for glasshouse laboratories and bottling plants.

Behind all the glass technology that is done at the Laboratories is, of course, basic, scientific research which relates directly or indirectly to specific glass problems. For example, physics and geology play a basic part in glass technology as it is carried on at Butler. Hence, under the general heading of Physics and Geology we find the Preston staff engaged in studies of the ultimate nature of the breaking processes of glass and other materials; fracture technology; the effect of adsorbed moisture; temperature co-efficients and crack propagation. Diagnosis of causes of breakage of glassware; rock crushing and ore-dressing; physics of "drag-cracks" in rocks and faults and fractures in rocks generally.

While it would be erroneous to convey the idea that Preston Laboratories is an institute concerned with scientific research in general, rather than glass technology which is its primary interest, the broad scope of scientific interest entered into could not escape the notice of this reporter. This is evidenced by work now being conducted for the United States Army and Navy in connection with the development and improvement of fire control instruments for airplanes, anti-aircraft batteries and training instruments. An outstanding example of work outside the glass industry, and yet of importance to glass, is the biological investigations through which it is hoped solutions of certain structural problems in airplanes may be obtained. A particular aim of these studies is the adoptation of glass fibers as a possible solution to these problems. Further evidence of this breadth of interest in matters scientific by the Preston Laboratories is revealed in the variety and number of published papers. Between eighty to one hundred papers have appeared in publications such as the American Journal of Science; Proceedings of the Smithsonian Institute; Journal of the American Ceramic Society; Journal of the Society of Glass



"The Shambles," Sagittarius and Taurus. By Edward Howard, the architect (son of George Howard, inventor of the Howard Feeder). This Zodiacal allegory is entitled "Shooting the Bull." The signs are deeply sandblasted into opaque and colored glass.

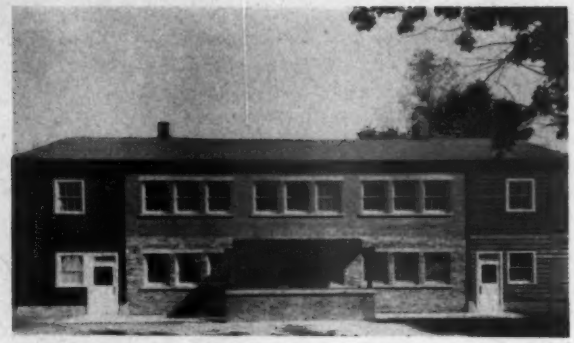
Technology of England; THE GLASS INDUSTRY and many others.

Exemplifying the purely scientific endeavors which sometimes engage the Preston staff is the report by Frank W. Preston for the Proceedings of the Smithsonian Institute of the Chicora Meteorite, a meteoric mass which flashed out of the heavens and landed without any serious consequences in Butler County in 1938.

A treatise on the physics of "Upward Drilling" in refractories and volcanoes, published in the American

"McCormick Dam" where the wild fowl stop off.

"Norris Dam" with African geese enjoying life in the Alleghenies.



The "Instrument" building housing certain experimental manufacture and partly employed for biological studies.

Part of upper floor of the "Instrument" building showing apparatus for working lenses, plastic prisms and for experimental optical devices. The ceiling in the further bay is Owens-Illinois "Microprite."

Journal of Science is another paper emanating from the Laboratories typifying its general scientific researches.

In connection with research on refractories, the Laboratories have been doing a great deal of work on tracer elements in refractories and their detection in glass. Here again the over-all interest in glass is indicated since these investigations are as important to window glass, for example, as they are to container ware.

As stated earlier in this article many changes have occurred at the Preston Laboratories since the first story appeared and these changes have not been confined only to the personnel and its work but also to the "plant." The original housing facilities have been augmented since 1938 by a storage shed where inactive research materials, apparatus and equipment for maintaining the buildings and grounds can be stored. It should be noted here that the laboratory grounds now amount to some eighty acres which permits experiments on explosives and combustible and inflammable liquids. The vast size of the grounds and topography of the country also make possible tests on range finding and height finding on planes which are continually flying over head.

Another new structure is the steel frame building or Pilot Plant measuring 80′ by 120′ by 40′ to the eaves. This was constructed to house the development for the Pennsylvania Wire Glass Company relating to a new form of structural glass. The third addition to the group of new buildings is a two-story structure of hollow wall construction, well insulated with glass wool. This building is now being used for certain experimental manufacture and part of it is employed for the biological investigations previously referred to.

The sum and substance of any organization—be it a scientific laboratory, a glass plant or an Army—is people, hence the story of Preston Laboratories would be incomplete without some mention of the staff which must carry out the broad policies and undertakings of Dr. Preston.

As in all organizations the war has wrought changes in personnel and the present complement of about thirty people is practically an entirely new staff, formed within the last five years. As a result of this turnover in personnel and the highly specialized training required it was found that the distribution of functions had to be changed as the personnel changed, in other words, the law of supply and demand as it relates to human endeavor had to be reversed and the job had to be adapted to the man and not the man to the job. In spite of all difficulties, however, the research staff under Dr. Preston are carrying out many important research projects and to complete the record the names of these individuals should be recorded. They are: Dr. L. G. Gehring, chief chemist; Dr. A. M. Knight, physical chemist; Herman J. Scholtz, chief draftsman and assistant engineer; Brian B. Christman, ceramist and specialist in optical glass and plastic elements; H. Eugene Powell, chief physicist; Rus-

(*Continued on page* 38)

Interior view of Pilot Plant showing apparatus for forming structural glass.

A corner of the lower floor of the "Instrument" building—the biologist office.

SOME MICROANALYTIC METHODS FOR THE INVESTIGATION OF GLASS

PART II

Determination of Chromium

The sample is dissolved with concentrated sulfuric acid and hydrofluoric acid. The dry residue is digested with a small amount of distilled water and transferred into a porcelain crucible. .3 cc. bromine water and enough sodium hydroxide are added to have the solution neutral towards litmus paper. The solution is heated for about two minutes on the water bath and if necessary excess bromine is reacted with a few small crystals of phenol. To the cooled solution a few tenths of a cc. of a 1 per cent alcoholic solution of diphenyl carbazide are added. The reddish color, which is due to the alkaline diphenyl carbazide, is removed by addition of a small amount of 2N sulfuric acid and the presence of chromium will be indicated by a characteristic bluish violet color. As little as .5 gamma chromium can be detected. The bluish violet color will depend on the amount of chromium present. Amounts over 10 gamma will give a lilac color, while smaller amounts will be more violet and very small amounts will lead to a more pinkish violet.

It is possible to differentiate between chromates and chromic salts. However, this method is not too reliable. To detect chromates one proceeds as above, however, under omission of the oxidation step with bromine and sodium hydroxide. To test for chromic salts, chromate is precipitated by means of an addition of a few drops of a solution of ammonium acetate and barium chloride. The filtrate is then treated as described in the first paragraph. It should be noted, however, that on solution of chromates the sample may be reduced so that this test for chromic salts cannot be regarded as accurate.

In the presence of manganese, copper or cobalt this test has to be modified as follows:

The dissolved sample is washed into a small beaker and according to the amount of substances which can be oxidized about .3 to 2 cc. bromine water are added together with the sodium hydroxide. The solution is heated for about three minutes and the formed precipitate is filtered off. The filtrate is put into a small porcelain crucible and slightly heated, whereafter a few phenol crystals are added. Then one proceeds as described above. About 2 gammas chromium could be detected in the presence of 10 to 15 milligrams manganese, copper or cobalt.

Determination of Copper

Two methods are suggested. The first one can be used in the presence of all elements with the exception of cobalt or nickel, while the second one can be carried out in the presence of these elements, however, being unsuitable in the presence of certain other elements.

(a) Determination with Ammonium Mercury Thiocyanate:

The sample is dissolved with concentrated hydrochloric acid and hydrofluoric acid. The dry residue is washed into a porcelain crucible and then the following reagents are added in the indicated sequence: two drops of a 1 per cent solution of zinc acetate; two to three drops of a solution of ammonium mercury thiocyanate solution (dissolve 8 grams mercurous chloride and 9 grams ammonium thiocyanate in 100 cc. distilled water). After brief stirring the presence of copper is indicated by the formation of a violet precipitate. Seven gamma copper can be detected in this manner.

(b) The sample is dissolved with concentrated sulfuric acid and hydrofluoric acid. The dry residue is treated with a drop of concentrated sulfuric acid and then heated on an asbestos mat until sulfuric acid vapors are noticeable so as to remove all the fluorine. Then one adds a drop of 1:4 hydrochloric acid. Then it is washed with three to four drops distilled water into a porcelain crucible and .2 to 1 cc. of a 2 per cent alcoholic solution of para-ammino phenol chlorohydrate solution added. In the presence of copper the solution becomes violet to bluish violet. Down to 20 gammas copper can be detected. The sensitivity of the reaction can be increased by adding a few crystals of ammonium fluoride whereby a yellow coloration can be obtained. As little as 2 gammas copper will lead to a yellow coloration. In the presence of colored ions, such as cobalt, nickel, chromium or the like the sensitivity is somewhat repressed, however, 20 gammas copper could be detected in the presence of 4 milligrams cobalt or 14 gammas copper in the presence of 6 milligrams nickel without the use of ammonium fluoride. When ammonium fluoride is used the yellow color will indicate as little as 7 gammas copper in the presence of 4 milligrams cobalt and 7 milligrams nickel. The presence of ferric iron does not impair the reaction if ammonium fluoride is used. Interference of chromates may be avoided by heating the solution with sulfuric acid and alcohol so as to reduce them. The detection of copper in the presence of gold is not possible.

Determination of Iron

(a) Determination of Iron Regardless of Its Valence:

The sample is dissolved (and also oxidized) with concentrated nitric acid and hydrofluoric acid. The dry residue is dissolved with one drop of 1:4 hydrochloric acid and three drops distilled water and transferred into a small porcelain crucible. A few drops of a 10 per cent aqueous solution of ammonium thiocyanate are added. Little iron is indicated by a pink, more iron by a red coloration. As little as .5 gamma iron can be detected. Other ions do not interfere with this method.

(b) Determination of Ferrous Iron:

Solubilization has to be carried out in a stream of carbon dioxide to avoid oxidation of ferrous iron. For this purpose an apparatus described as follows may be used. A sheet of lead having a hole for a crucible

and a circular groove and holes for a tube is put over a water bath. A funnel which fits into a groove is inverted over the crucible and sealed to the lead plate with a glycerin water mixture. The coarsely ground sample is put into a small platinum crucible and two drops concentrated sulfuric acid and .5 cc. hydrofluoric acid are added. The crucible then is inserted into the hole of the lead plate and is evaporated in a steady stream of carbon dioxide which is led in through the tube. The dry residue then is washed with .3 cc. distilled water into a porcelain crucible. A few crystals of tartaric acid and .1 to .5 cc. of a 1 per cent alcoholic solution of dimethyl glyoxime are added. After the reaction mixture has been rendered alkaline by the addition of ammonia ferrous iron will cause a red coloration. As little as 2 gammas ferrous iron may be detected. It is advisable to carry out the various steps of the test as fast as possible to avoid oxidation of the ferrous iron. If only small amounts of ferrous iron are present it may be advisable to mix ammonia, tartaric acid and the reagent in the porcelain crucible and only then to add the dissolved dry residue.

This method is not suitable in the presence of nickel. The authors indicate that α', α' = dipyridyl may be suitable for this purpose.

(c) Determination of Ferric Iron:

Ferric iron can only be determined with certainty if ferrous iron is absent. The sample is dissolved as described under (b), but tested as described under (a). The presence of ferric iron can only be assumed to be certain if a strong red color is obtained.

Determination of Gold

Two methods for dissolving the glass are suggested. The second method will be used where gold is present in the metallic state (which is usually the case) and where other ions due to their color may have an interfering influence. Special modifications are given for the presence of silver, chromate and cerium.

The sample may be dissolved with concentrated nitric acid and hydrofluoric acid. The dry residue is washed into a porcelain crucible with 3 cc. water and 1 to 2 drops of concentrated nitric acid. Two cc. aqua regia are added to dissolve metallic gold. The crucible is covered and the solution evaporated to dryness. The residue is then moistened with .1 cc. concentrated hydrochloric acid and evaporated to dryness, which procedure is repeated two more times. Then a few drops of water are added to dissolve the residue. A 1 per cent solution of benzidene in a 10 per cent acetic acid is added and in the presence of gold a blue coloration is formed. Seven gammas gold may be detected.

Where gold may be assumed to be present as elementary gold only the interference of other ions may be avoided by using the following procedure: The dry residue is digested with three drops of concentrated nitric acid and 2 cc. distilled water and then filtered. The filter then is combusted and the ash is dissolved with a very small amount of aqua regia. In this manner almost always 40 gammas gold could be detected in the presence of five hundred times of other ions.

If silver is the interfering ion the first described method may be used, however, after treatment with hydrochloric acid the formed silver chloride should be filtered off through a fine filter paper.

In case not too large amounts of chromate is the interfering substance the chromate may be reduced to chromic salts by treating the residue after the hydrochloric acid treatment as follows: the residue is evaporated three times with a 3:1 mixture of alcohol and hydrochloric acid. In the case of larger amounts of chromate, however, the color of the chromic ions will impair the sensitivity of the reaction.

If cerium ions are interfering, use is made of the fact that the blue coloration due to cerium is not as stable as that formed by gold. Again use is made of the first described method but after blue coloration is obtained an additional amount of .5 to 3 cc. of the reagent solution is added (dependent on the amount of cerium present). If after a few minutes the color does not fade to a light purple the presence of gold is indicated. This method is satisfactory if the ratio of cerium to gold is not too large. Thus 30 gammas gold could be detected in the presence of 2 millagrams cerium.

Determination of Selenium

The sample is dissolved with concentrated nitric acid and hydrofluoric acid. The dry residue is evaporated several times with .3 cc. concentrated hydrochloric acid and then dissolved in hydrochloric acid and distilled water under the addition of a small amount of hydrazine hydrochloride. After a brief heating on the water bath selenium will cause a red coloration or precipitate. As little as 2 gammas selenium may be detected. The only interfering substances are gold and tellurium in the presence of which one may proceed as follows:

In the presence of gold the elementary gold may be filtered off and the filtrate may be tested as above after evaporation with hydrochloric acid.

In the presence of tellurium the dry residue should be taken up with 1:1 hydrochloric acid, since in this highly acid solution tellurium is not reduced by the hydrazine.

Determination of Cerium

The sample is treated on a platinum foil with one drop of concentrated sulfuric acid and about 3 cc. hydrofluoric acid. After evaporating to dryness a few small pieces of potassium pyrosulfate are added and the mixture is melted over an open flame. After leaving it for a while at red heat the mixture is cooled. The residue is dissolved with a drop of concentrated nitric acid and 3 to 5 cc. distilled water. The solution is concentrated on the water bath to about 1 to 2 cc. The solution is transferred into a small porcelain crucible. Enough ammonia is added to obtain alkaline reaction and then a few drops of a 10 per cent hydrogen peroxide solution are added. Small amounts of cerium cause a yellow coloration, larger amounts lead to a yellow to brown precipitate. Ten gammas could be detected in this manner.

In the case of the presence of interfering ions, such as iron, manganese, cobalt and nickel the method may be modified as follows: The sample is dissolved in a small platinum crucible by adding two drops of concentrated nitric acid and about 3 cc. of hydrofluoric

(*Continued on page* 41)

THE MECHANISM OF GLASS CUTTING

PART I.

EDITOR'S NOTE: Such simple technical operations as the cutting of glass are frequently based on complicated mechanisms which can be explained only by relatively complicated theoretical assumptions. Full understanding of such simple technical operations should be of interest also to the technical man. We found a comprehensive discussion of this problem in an article by H. Jebsen Marwedel—the author of "Glastechnische Fabrikationsfehler" (Defects in Glass Manufacture)—in collaboration with K. von Stoesser, a free translation of which is given in the following.

Cutting Tools and the Process of Cutting

Plate glass is cut by breaking it. To control "breakage" the glass is previously weakened along a predetermined line. Weakening is brought about by superficially scratching the glass. The hardness of the glass makes it necessary to use diamonds or special steels for this purpose.

The outstanding hardness of diamonds allows their use as cutting tools without appreciable wear if natural cutting edges of diamonds are used. A. J. Holland and W. E. S. Turner[1] have shown that while an artificially prepared diamond cutting edge will be noticeably worn off after a hundred cutting operations, a natural diamond cutting edge will hardly show any wear after twelve hundred cutting operations. A suitable natural cutting edge of a diamond is shown in Figure 1 which shows a front and side elevation of the cutting edge. In the left part of the figure the direction of cutting is indicated by an arrow. As can be seen a slightly inclined wedge shaped edge and not only a point is used for the cutting operation.

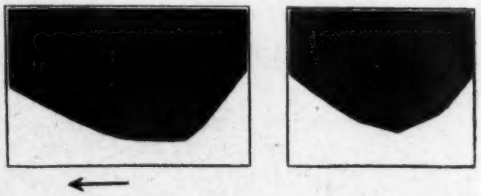


Fig. 1. Natural Cutting Edge of a Diamond (according to Holland and Turner[1]).

Hardened special steel tools in place of diamond tools are usually prepared in the form of rotating wheels having a wedged, sharpened edge.

The effectiveness of a cut is dependent to a large degree on the manipulation of the cutting tool and on its quality. A diamond cut made by an inexperienced operator may lead to a deep groove, which can be easily recognized as a rough white line, but which, however, will be less effective than a much finer line as obtained by an experienced operator. Similarly, deficient or worn out cutting tools may lead to apparently stronger cuts which will lead to a less neat separation of the glass. W. Jones and M. Blair[2] have discussed the dependance of the cut on the technique used for cutting.

In Figure 2 such "good" and "bad" cuts are shown. The magnification of a perfect cut in Figure 2 a. shows that destruction of the glass has not extended further than over an area 30μ wide. Parallel to the cut, interference lines, which are due to cracks extending below the glass surface, can be seen. Figure 2 c. which is a magnification of a bad cut, shows that destruction, even disregarding some individual lateral cracks, extends over an area about 200μ wide.

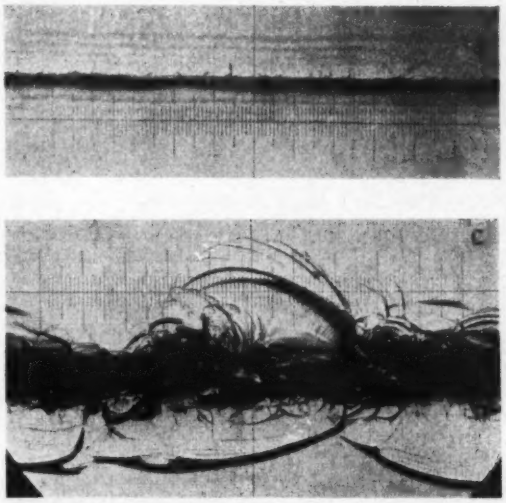


Fig. 2. Cuts Made with the Same Tool on a Glass Plate. a. Perfect cut. c. Bad cut.

Experienced operators can tell the difference between a "good" and a "bad" cut by its sound. A good cut will give almost a harmonious ring, while a bad cut will make a scratchy noise.

The quality of a cut can be recognized by the appearance of the fracture surface. The better the cut the smoother will be the fracture surface. A bad cut will show conchoidal fracture and sometimes even cracks deviating from the direction of fracture.

As has been mentioned before cutting with a diamond causes a weakening of the glass. This weakening, however, is due not only to the fact that a wedge shaped groove has been cut into the glass surface, since if this were the case a wide and deep groove should result in a severe weakening of the glass and often the contrary is the case. The width of the groove is no yard stick for the weakening of the glass. "Good" cuts form a narrow cut, which extends perpendicularly into the glass. The cut will be surrounded by strains and stresses which in a way will provide part of the energy necessary for the subsequent fracture. In this manner the propagation of fracture will be predetermined, since fracture will have a tendency to follow the direction of least expenditure of energy.

This can be observed by viewing under polarized light a scratched plate perpendicular to the direction of the scratch. It can be easily seen that the distribution of strains around the "good" cut in the right hand part of the picture (symmetrical strain distribution) will be by far more favorable for even fracture than the irregular distribution around the "bad" cut on the left hand side of the picture.

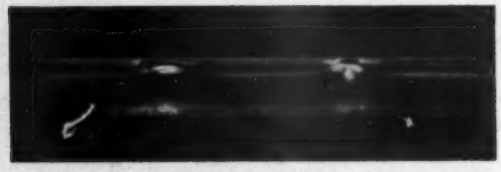


Fig. 3. Strain patterns. Left side: bad cut. Right side: good cut. 1.75 magnification under polarized light at 45° illumination.

Structure of Cuts

To establish the actual structure of changes caused by a cut, cutting grooves were made on a glass plate. In order to view their effect in cross section the glass had to be cut normal to the original cuts. So as not to disturb the structure of the original cuts the perpendicular cut was made from the opposite surface. In this manner the individual cuts were entirely undisturbed and could be examined under the microscope. Results obtained are illustrated in Figure 4.

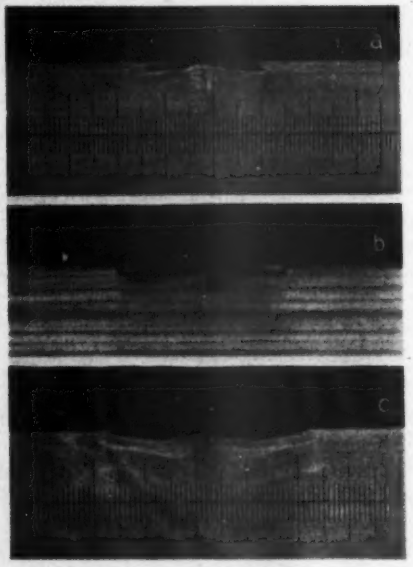


Fig. 4. Cross Section of a Cut. a. Fresh cut. b. Aged cut. c. Profile after removal (spontaneous or arbitrary) of the side fractures.

Figure 4 a. shows two cracks which extend away from the groove under the surface of the glass and the slightly curved shape of which indicates that the glass will have a tendency to break loose above it. At first however these glass splinters will stay in place and the fine glass dust formed during cutting will be wedged in between them. As shown in Figure 4 b. the splinters may be slightly lifted up due to the pressure exerted by the packed in glass dust.

The main characteristic of the cut, however, is not the formation of the groove, but the formation of a crack which extends perpendicularly into the glass. This crack is under tension due to the glass dust which is pressed in between the side parts of the groove. This crack accordingly is the initial step of the splitting of the glass. *It is this formation of a perpendicular crack which forms the basis of successful glass cutting* and not, as has been assumed often, the width of the scratch.

Gradually the glass splinters may be lifted up (Figure 4 b.) and then fall off or be removed (Figure 4 c.). Accordingly the perpendicular crack will close up somewhat and appear smaller, since part of the tension will be removed. This phenomenon at times was designated as "recovery" of the glass or it was said that the "hot cut has cooled out".

The splinters as a rule are rather long strips of glass which are parallel to the cutting groove, and only bad cuts will produce conchoidal fracture. This conforms with the observation of F. Rinne, A. J. Dalladay and F. Twyman[3] that good cuts frequently are accompanied by parallel interference lines. Splintering off then occurs after cracks parallel to the cut have formed and long flat strips about ½ mm. wide and several centimeters long will form.

Figure 5 shows a large magnification of a cross section of a cut. It should be noted that the actual cut is extremely small. It is about .01 to .02 mm. deep and at any rate is far less deep than the cracks extending away from it. It is further noteworthy that the ridge which is formed opposite to the cutting groove is about 120 to 130°, an angle which is characteristic also for the coneshaped fracture surface on impact with similar types of glass. However, in the present case the summit of the ridge is split by the perpendicular crack, which penetrates about .17 mm.

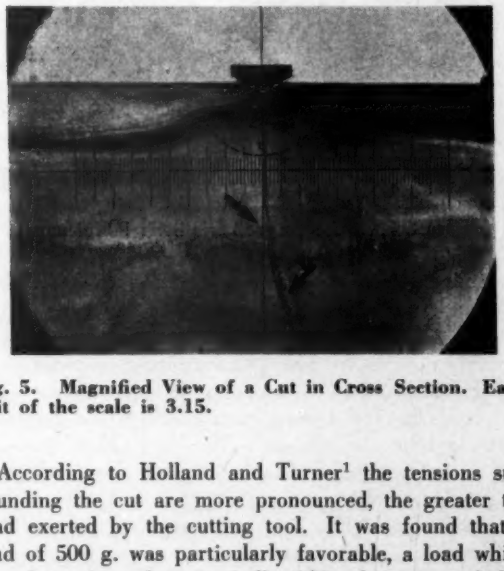


Fig. 5. Magnified View of a Cut in Cross Section. Each unit of the scale is 3.15.

According to Holland and Turner[1] the tensions surrounding the cut are more pronounced, the greater the load exerted by the cutting tool. It was found that a load of 500 g. was particularly favorable, a load which may be estimated to be well within the range of that exerted by a hand operated cutting wheel. Greater loads

are not expected to be of any additional advantage. On operating a hand cutting tool, accordingly one will not use a greater force than necessary to cut a glass of given strength safely without damaging the tool. Also using too great a force would impair the operators "feel" for guiding the tool at a preferable angle and will increase the danger of "scratching" the glass rather than cutting it.

To destroy the glass in the cutting groove it is necessary to overcome the tensile strength thereof. The tensile strength is about 800 kg per square cm. The actual mechanism can be best explained with reference to the schematic picture in Figure 6.

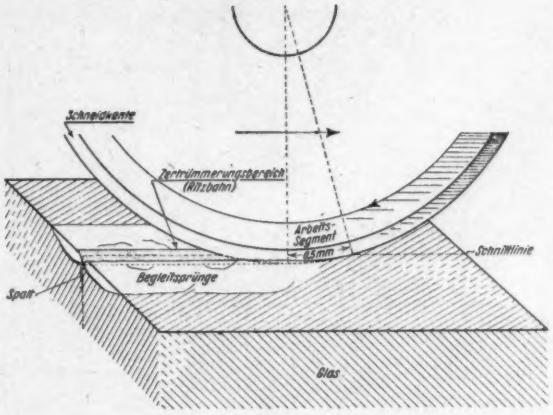


Fig. 6. Schematic Picture of the Cutting Mechanism.
Legend: Schneidkante ..... Cutting Edge
Zertrummerungsbereich (Ritzbahn) ..... Cutting Groove
Arbeits-Segment ..... Effective Cutting Edge
Schnittlinie ..... Cutting Line
Begleitsprunge ..... Lateral Splinters
Spalt ..... Perpendicular Crack

The effective cutting edge of the cutting tool in the picture is about .5 mm., that is the segment of the wheel extending from the deepest point in the groove to the glass surface. The cutting load covers an area which at most is about .05 mm. wide. Assuming a load of 500 g. this leads to a cutting force of about 2000 kg per sq. c., which is far greater than the tensile strength of the glass.

The well known fact that a fresh cut is more effective than an aged one needs some further explanation. The increase in strength of aged cuts according to some earlier work[1-2] is said to be about 20 to 30%, which is in good agreement with our own findings. As mentioned before part of the tension is due to the minute glass particles which are pressed into the fracture. A schematic picture of a cut (Figure 7) will be helpful in following the further explanation.

The right hand side of Figure 7 shows the fresh cut, while the left hand side represents the aged cut. It is known that glass, like most materials, shows fatigue phenomena. While at first the glass will bear up under the stresses and strains around the lateral cracks extending away from the cutting groove, they will after a while cause breakage of the glass, and as mentioned before strips of glass or in the case of bad cuts conchoidal fractures of glass will crack off along the cutting groove. As soon as these strips or fractured pieces have broken away the tension caused by the fine glass dust which was pressed into the destruction area will be released and the cut will be what is called "aged". The cracking away of glass splinters can be heard and seen for quite some time after the cut has been made. Holland and Turner[1] have shown that most of the aging takes place in the first five hours, while maximum is reached after approximately 1000 hours.

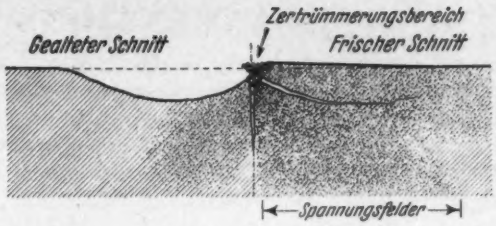


Fig. 7. Schematic Picture of a Cut.
Legend: Zertrummerungsbereich .... Area of Destruction
Frischer Schnitt ..... Fresh Cut
Gealteter Schnitt ..... Aged Cut
Spannungsfelder ..... Tension Area

[1] Breaking Strength of Glass. The Effect of Flaws and Scratches. J. Soc. Glass Tech. **20**, 279-302, 1936. The Effect of Transverse Scratches on the Strength of Sheet Glass. Ibid. **21**, 383-394, 1937.

[2] J. Applied Physics. **8**, 627, 1937.

[3] F. Rinne. Optics and Mechanics of Glass Cutting. Z. Min. Geol. Palaeontologie. Abt. A., 1926, 209-217; New Results on Glass Cutting. Umschau, 1927, 129. A. J. Dalladay and F. Twyman. The Stress Conditions Surrounding a Diamond Cut in Glass. Trans. Opt. Soc. **23**, 165-169, 1921-23.

• While there has been no official notification to the effect, THE GLASS INDUSTRY understands that the rigid restrictions on arsenic as a glass batch constituent may be eased in the near future and that the War Production Board may now be willing to consider requests for the product from the glass manufacturing industry.

FIBREGLAS INSULATION USED IN WIND TUNNEL

Effective use is being made of Fibreglas insulation to reduce the load on the air conditioning system embodied in the design of the huge altitude wind tunnel for research on aircraft engines, now being built at the Cleveland Airport by the National Advisory Committee for Aeronautics.

To aid in creating the desired differential between atmospheric and tunnel temperatures, and to maintain the differential so far as possible during set-up periods, approximately 70,000 square feet of Fibreglas insulation are being installed in the walls of the tunnel.

During test periods, walls of the tunnel will be subjected to vibration, making it necessary to use an insulation material which will not shake down and leave empty spaces for the inflow of heat from the outside. Fibreglas was selected largely because the interlaced glass fibers form a resilient mass that is believed will withstand the effects of such vibration. The Fibreglas insulation was manufactured by Owens-Corning Fibreglas Corporation.

INVENTIONS AND INVENTORS

A Summary of United States Patents of Interest to the Glass Industry Issued During November

Compositions

Patents issuing to Hans Steinbock of Dusseldorf-Gerresheim, Germany (vested in the A.P.C.), and to Robert A. Schoenlaub of Tiffin, Ohio, formerly of the Owens-Corning Fiberglas Corporation, are concerned with the same problem, the poor chemical durability of glass fibers when made of ordinary lime soda silica glasses. In fiber form the glass has relatively an extremely great area exposed to attack. When the alkali is moved to improve durability the maufacturing problems resulting from the poor workability and high refractoriness of the compositions are insurmountable for ordinary purposes. There is a similarity in the solutions offered by these widely separated inventors, as indicated by the following compositions given in their patents.

	Schoenlaub Patent 2,334,961	Steinbock Patent 2,335,463
Silica (SiO_2)	52 to 56%	55 to 60%
Lime (CaO)	16 to 19	
Alumina (Al_2O_3)	12 to 16	3 to 10
Boric Oxide (B_2O_3)	9 to 11	10 to 15
Magnesia (MgO)	3 to 6	
Barium Oxide (BaO) or other alkaline earth	20 to 30	

Both inventors allow themselves variation in the minor constituents for specific purposes. Schoenlaub reports that his composition can be melted in the usual tanks with very little modification of practice, and that the distinguishing characteristic is its easy fusibility. Major differences between Schoenlaub's and Steinbock's compositions reside in their treatment of the alkaline earths. The former uses lime and magnesia and warns that they are not equivalent. Steinbock includes the entire group of alkaline earths but specifies that mainly he will use barium or barium and strontium oxides.

Lamp Working

Patents assigned to Sylvania Electric Products, Inc., include 2,344,784 granted to Carl F. Miller of Corning, N. Y., and 2,335,617 to Ralph B. Thomas of Beverly and R. M. Gardner of Swampscott, Mass. The latter describes an apparatus for sealing the stems to tubular lamps such as fluorescent lamps. The Miller patent concerns means of forming a composite stem-base for a radio tube, and of sealing the metal contact prongs into the glass base. Fig. 1 illustrates the method used. The upper view shows a number of contact prongs, 4, after insertion loosely through pre-formed holes. At this stage, burners B, are applying heat to both the outside and inside of the glass base. In the lower view pressure has been applied vertically by means of an expansible chuck and expansible chuck mold so that the softened glass is forced into permanent contact to seal the prongs into place.

Frank C. Perkins of Warren, O., assigned to General Electric his patent 2,334,123 for a method and apparatus for completing lamps with sealed-in reflectors. Such lamps are made in two pieces of which the reflector section is parabolic and supports the filament which is sealed to it. Over the mouth of the reflector section is sealed a lens or pressed glass cover. Mr. Perkins has been granted a patent which covers the method of sealing, in which the edges of the two sections are placed together, heated to a plastic condition, and then the space between evacuated to a degree which draws the sections together with a force great enough to seal them. Another General Electric patent is 2,334,604 granted to Albert Bunger of Berlin-Pankow, for apparatus for heating and pressing the glass of electron tubes into contact with the metal conductors.

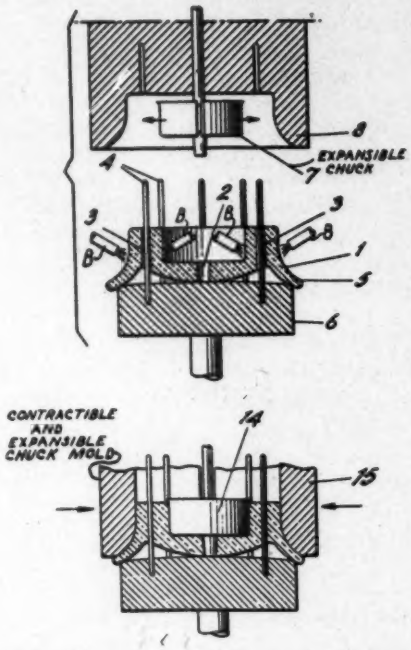


Fig. 1. 2,334,784: Miller. To seal electrodes into a glass base for electron tubes, heat is applied and the glass is pressed around the metal.

The stem sealing problem was also attacked by RCA inventors in patents 2,334,001 granted to J. C. Hapgood of Chatham, N. J., and 2,334,020 to H. J. Miller and J. M. Spooner of South Orange and Summit, N. J. The first concerns the sealing of conductors into radio tubes but the latter covers a more general discovery relative to the nature of glass-to-metal seals. Their explanation starts with a statement of the difficulty of sealing glass to iron or steel due to the thickness of the oxide film which forms on the metal when it is heated for sealing. Apparently reducing or neutral atmospheres do not wholly solve this problem. The solution they report is that of coating the metal with silver which allows the small amount of iron oxide to diffuse into it and at the same time limits the amount of air which can reach the iron. They report that a very strong bond is then produced when this coated conductor is sealed into glass.

Feeding, Forming and Shaping

Fig. 2 from patent 2,335,386 assigned to the Jeannette Glass Co. by Hugh S. Brady of Greensburg, Pa., shows a feeding device in which the glass is conducted over shaping rolls to the shears 23a. The rolls are in effect electrodes through which heat is applied to the glass by electrical means to keep it from chilling. It is generally recognized that the glass should have as little contact as possible with elements which might cool or mark it, but at the same time Brady points out that the procedure of suspending the outflow from the furnace and severing a gob to fall directly into the mold also falls short of perfection. A characteristic which sometimes mars the product of this common method is the stretching or necking of the glass due to gravity.

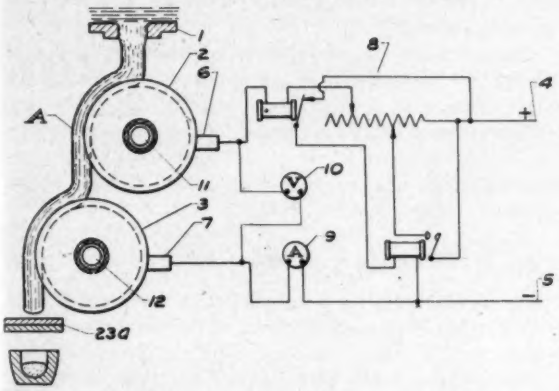


Fig. 2. 2,335,386: Brady. Feeding device in which the glass passes over electrically heated shaping rolls in transit to the shears.

Fig. 3 also illustrates a feeding device. This one appears in patent 2,334,064 granted to C. A. Brown and C. W. Craig of Cleveland and assigned to General Electric. The principal object is to separate a free falling stream of glass into gobs and to accelerate their movement. The particular form of feeding apparatus illustrated supplies gobs to a lamp base assembling machine to form the insulating buttons for the bases. The central shaft 17 carries thin knives 11 so that they pass through a slot in a cutting block and sever small gobs from the glass stream 11. Impellers 15 and 16 also actuated from the drive shaft imbed themselves slightly into each gob and impel it into the mold.

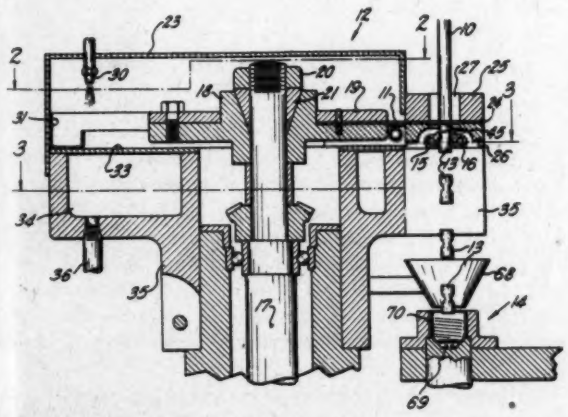


Fig. 3. 2,334,064: Brown and Craig. Gob feeding device which impels the charges at accelerated speed into base molds for electron tubes.

Apparatus for molding lens blanks is described in 2,335,419 granted to Perry Johnston of Ford City, Pa. (Pittsburgh Plate Glass Co.), and 2,333,131 granted to E. D. Tillyer and H. E. Hasenzahl of American Optical Co. The latter seems to be directed mostly to the molding of plastics but glass is not excluded. Its purpose is to press the lens so accurately as to avoid the requirement of extensive polishing. They use glass dies because they can so readily be finished to an optical surface. Usually such dies would be susceptible to high breakage in use. To overcome this problem the inventors have designed a pressing assembly in which a compressible substance such as rubber or a gas or liquid surrounds the sides of the die so that the same pressure will be exerted on its sides as that applied vertically.

In certain fields such as the manufacture of projection screens for motion pictures it is the practice to coat surfaces with tiny glass beads, usually imbedded in an adhesive matrix. An apparatus and method for producing these beads is the subject of patent 2,334,578 granted to Rudolf H. Potters of Jamaica, N. Y. These beads have diameters of the order of 0.008 to 0.055 inch. As indicated in Fig. 4 the apparatus combines a fusing means and an air separator to remove the produce. Particles of ground glass of suitable size are fed by supply pipes 14 into a fusing zone where burners generate enough heat to fuse them to rounded form. A rising air current lifts the product and removes it to the outlet from which it is collected at 19.

The August 1942 issue of GLASS INDUSTRY discussed patent 2,284,796 issued to W. K. Berthold of Rockville, Conn. (Hartford-Empire Co.) for removing from the machine such ware as hollow electrical insulators, on a head which has the same shape as the inside of the ware. In that patent and the Reissue 22,392 which has just issued the removal head is shown with a central orifice through which a jet of air is blown to hold the ware from chilling contact with the metal.

Patent 2,334,653 issued to R. A. Senkbeil of Baltimore (Maryland Glass Corp.) covers a core which is adopted to be moved into the bottom of a mold for forming a pocket in the molten glass just after it has been dropped into the mold, the core serving to press the glass into a matrix at the lower end of the mold for forming the neck of a bottle. As is common, a ring mounted on the core serves to seal the mold so that glass will not be forced out around the core. In Senkbeil's design this ring, slidably mounted on the core, is attached to and supported by a series of springs so that enough resilience is provided to prevent the usual frequent breakage of the rings.

Patent 2,333,723 granted to John W. Jordon of Port Allegany, Pa. (Pittsburgh Corning Corp.) concerns a wall laid up with glass blocks and mortar. The blocks are made with channeled edges to provide a place for the mortar, and the bonding surface is covered with a layer of vinyl acetyl resin which is cellulated to relieve stresses upon the blocks due to volume changes in the mortar.

(*Continued on page* 34)

Research Digest

Practical Interpretations of Glass Technology

Refractory Materials for Glassmaking

J. H. Partridge, writing in the General Electric Co. Journal (12, (3), 119-31, 1943), traces the historical development of glassmaking and shows how the modern glass-tank furnace was evolved. In discussing present day methods Partridge states that a close control of temperature and output in the tank furnace is necessary because (1) the viscosity of glass changes rapidly with temperature, (2) the volatilization rate of alkali varies and gives rise to streams of glass of different composition (streaking or cording of glass), and (3) fluctuations of output also result in cordiness.

In discussing the role of refractories in glass manufacture the author states that the dissolution of the refractory lining also impairs the quality of the glass. The mineralogical constitution, determined by X-rays, of a number of fire-clay and sillimanite tank blocks was discussed in the light of their durability. A good tank block should be fired to 1400°C (2552°F) when well developed mullite crystals are formed. Texture, porosity and constitution tests should also be supplemented by a corrosion test. The method used by Partridge consists in founding glass under specified conditions in a small crucible made by boring a hole in a suitable specimen of the refractory under test. The increase in the alumina content of the glass is taken as a measure of the resistance to corrosion.

Some blocks of low porosity and close texture are not resistant to corrosion because the glassy matrix is more soluble (or fusible) than usual. This can be detected by long-period tensile tests at 1350°C (2462°F) or 1400°C (2552°F) under a stress of 500 gm. per sq. cm. The rate of extension is then a measure of the fluidity of the inter-crystalline cement. In the case of tuck-stones which seal the gap between the roof and walls of the glass tank, attack by the batch dust causes the face of the tuck-stone to decompose into α-alumina and a siliceous liquid. This reaction occurs only at 1810°C (3290°F) in pure materials but takes place at 1470° to 1500°C (2678 to 2732°F) in the presence of batch dust and impurities in the clay.

As a result of tensile and corrosion tests, such as described, it has been found that siliceous materials are less corroded than normal 40 per cent alumina material and the former have been successfully used to replace the latter in actual service.

The Use of Glass Fiber in Distilling Columns

During the November meeting of the American Institute of Chemical Engineers in Pittsburgh, Dr. J. H. Koffolt summarized the results of tests made in order to obtain data on the performance of glass fibers used to pack columns employed for the distillation of industrial alcohol which replaced the tinned-copper bubble plates generally used for this purpose before the war.

In the conversion to industrial alcohol production several of the large distillers employed glass fibers as the packing material in their distillation units. While these units have been successfully producing for over a year a high purity alcohol for war needs at a high production capacity, no data was available concerning chemical engineering characteristics of the glass fiber packing material. This investigation was undertaken to supply such data, and is the first of a series on the use of glass fibers as tower packing.

From the results of laboratory studies it was concluded that glass fiber packing appears to possess all the characteristics of a satisfactory material for industrial packed column distillation work, including good rectifying performance, high rate of through-put with low pressure drop, low hold up, consistent behavior, light weight per unit volume, and low cost.

A.S.T.M. Standard Test Methods

The several tentative standard test methods which have been developed through the work of the various sub-committees of A.S.T.M. Committee C-14 on Glass and Glass Products have recently been adopted as standard methods.

The list of methods is as follows:

1—Chemical Analysis of Glass Sand (C 146-43)

2—Hydrostatic Pressure Test on Glass Containers (C 147-43)

3—Polariscopic Examination of Glass Containers (C 148-43)

4—Thermal Shock Test on Glass Containers (C 149-43)

5—Flexure Testing of Glass (Determination of Modulus of Rupture) (C 158-43)

6—Chemical Analysis of Soda-Lime Glass (C 169-43)

Copies of these standard methods may be obtained at a nominal cost from the A.S.T.M. These methods should be used by those interested in adopting standardized procedures.

BELGIAN SCIENTIST TO JOIN PRESTON LABORATORIES

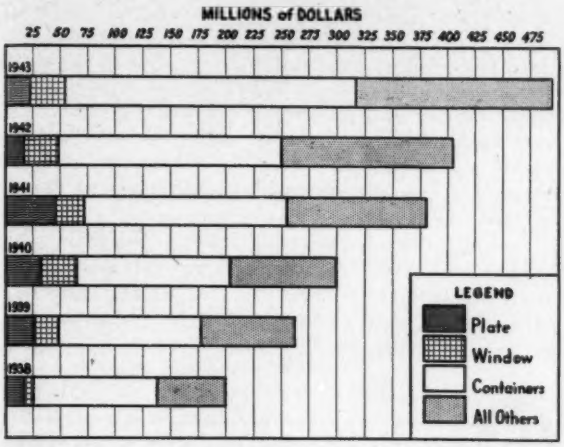
Professor Eugene F. Poncelet, a native of Belgium, will join the research staff of Preston Laboratories early in 1944. Professor Poncelet served with the Belgian Army in the last war and later was a special interpreter, first with the British and then the American armies. Upon coming to America he spent some time at Stanford University and then for several years was a consulting mining engineer in Canada. He has also done special research work at the Massachusetts Institute of Technology, as a guest of the Institute.

Professor Poncelet will continue the same general line of research at the Preston Laboratories, dealing with fundamental problems of rock cracking, ore-dressing, and glass fracturing.

CURRENT STATISTICAL POSITION OF GLASS

THE GLASS INDUSTRY'S INDEX

Production: Ten Months, January Through October



October activity in the glass industry showed an increase over the previous month in production, employment and payrolls. According to the Production Index, output during October was $47,000,000 as compared to $42,000,000 for the same month in 1942. The cumulative total for the first ten months of 1943 was $440,000,000 as compared to $405,000,000 for the corresponding period of last year.

Plate Glass production during the month of November, 1943, totalled 7,349,416 sq. ft., according to the Plate Glass Manufacturers of America. This was an increase of more than 8 percent over October, and of 59 percent over November, 1942. Total production for the first eleven months of 1943 was 66,981,620 sq. ft. compared to 57,248,174 for the same period of 1942—an increase of 17 percent.

Glass Container production during November totalled 7,812,761 gross, as reported by the Glass Container Association of America. This was a decrease of 8 percent from the preceding month and an increase of 25 percent over November, 1942. Total production for the first eleven months of 1943 was 85,036,111 gross as compared with 72,372,988 gross for the same period of 1942—an increase of 17 percent.

Shipments of glass containers for November decreased 6 percent from October, but showed an increase of 26 percent over November of 1942. Total shipments for the January-November period of 1943 were 86,814,092 gross, an increase of 19 percent over these eleven months of 1942.

The outstanding gains over November, 1942, were: narrow neck food containers—31 percent; wide mouth food containers—35 percent; medicinal and toilet ware —22 percent; general purpose ware—51 percent; domestic fruit jars—131 percent; and domestic jelly glasses—28 percent. A decrease was reported for beer bottles—11 percent; liquor ware—18 percent; and milk bottles—6 percent. Major increases for the first eleven months over the same period of 1942 were: narrow neck food containers—34 percent; wide mouth food containers—38 percent; general purpose ware—50 percent; and domestic fruit jars—131 percent.

Inventories on glass containers for November were 4,604,612 gross—43 percent less than a year ago.

Automatic tumbler production for November totalled 4,878,221 dozens, a 29 percent increase over the amount for November, 1942. During the first eleven months of 1943 the output was 51,123,723 dozens, or an increase of 8 percent over the January-November period of 1942. Shipments of automatic tumblers for November were 4,445,447 dozens, as compared with 3,535,057 dozens shipped during this month last year. Total shipments from January through November were 51,664,444

CURRENT GLASS CONTAINER PRODUCTION

(All Figures Are in Gross)

	Production		*Shipments*		*Stocks*	
	Nov. 1943	*Nov.* 1942	*Nov.* 1943	*Nov.* 1942	*Nov.* 1943	*Nov.* 1942
Narrow Neck	535,635	624,703	547,491	449,944	271,795	711,793
Wide Mouth	2,171,400	1,390,435	2,265,405	1,660,562	795,182	1,398,694
Pressed	80,189	40,847	80,229	45,586	32,982	54,099
Food Containers—Total	2,787,224	2,055,985	2,893,125	2,156,092	1,099,959	2,164,586
Pressure and Non-Pressure	443,235	350,937	400,485	330,913	289,537	345,137
Beer Bottles	586,097	738,747	614,966	681,160	147,027	392,705
Liquor Ware	868,528	836,355	832,520	819,685	528,672	1,510,450
Medicine and Toilet Preparations	2,088,383	1,418,877	2,151,632	1,507 612	1,832,220	2,572,447
General Purpose	662,082	530,522	683,651	519,529	306,738	580,460
Milks	269,779	265,463	262,331	252,458	345,338	377,920
Fruit and Jelly	107,433	38,406	83,577	13,603	55,121	175,230
Total Industry	7,812,761	6,235.292	7,922,287	6,281,052	4,604,612	8,118,935

Now $3.50
HANDBOOK of the GLASS INDUSTRY

• The first printing of the Handbook of the Glass Industry has become exhausted and the continued demand for copies has resulted in a second binding.

Through printing economies obtained by a lowered unit cost in the second printing of the Handbook we are able to offer this useful, ready reference glassman's handbook at the *reduced price of $3.50 per copy.*

The Handbook of the Glass Industry is the only quick ready reference glassman's handbook for general factory manager, superintendent, combustion engineer, chemist, department foreman and every glassman regardless of his title or job.

The supply at the new low price is limited so may we suggest that you enter your order now!

THE GLASS INDUSTRY
55 West 42nd Street
New York 18, N. Y.

Date.....

Please enter my order for ..... copies of the Handbook of the Glass Industry at $3.50 per copy.

Name..... Company.....

Address .....

.....

dozens, or approximately 9 percent over the total reported for this period in 1942. Finished stocks on hand at the end of November amounted to 6,744,810 dozens.

Table, kitchen and household glassware: Manufacturers' sales of machine-made table, kitchen and household glassware were reported at 1,933,141 dozens for November, a decrease of 51 percent from last year.

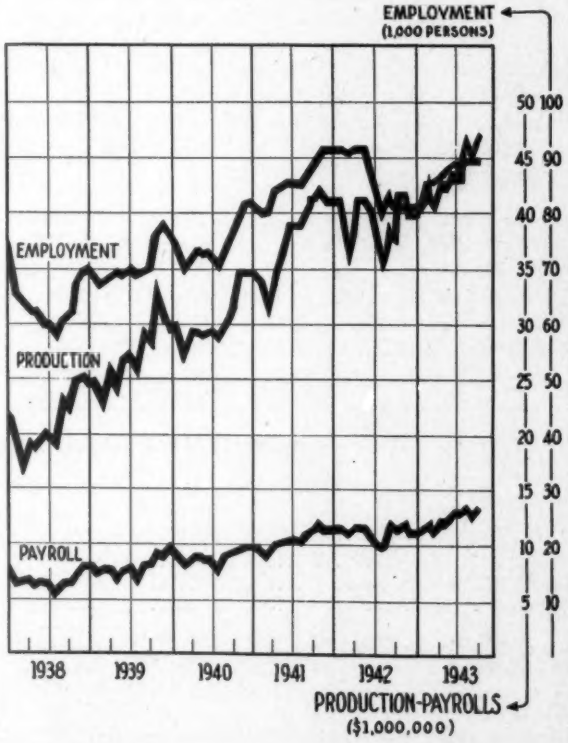
Miscellaneous glass products manufactured in October were estimated at $17,000,000, which is the same as shown for September. During the first ten months of 1943 miscellaneous glass products totalled $163,000,000, comparing with $152,000,000 for the January-October period of 1942.

Employment and payrolls: The number of persons working in the glass industry during October totalled 90,000, a slight increase over the number reported for September. This compares with 81,000 employed during October of last year.

Payrolls in October were estimated at $13,500,000, an increase of $500,000 over September. This is a 12 percent increase over October 1942. Glass manufacturers have paid about $140,000,000 in salaries for the first ten months of this year.

GI THE GLASS INDUSTRY'S INDEX

Monthly Trends Through October, 1943



●● Corning Glass Works announces that Harold W. Nutting will assume direction of distributor sales and promotion in the New England Territory for the Pyrex Housewares Products of that company effective January 1.

J. H. Wright H. S. Wade

REORGANIZATION PROGRAM FOR OWENS-ILLINOIS GLASS

Effective January 1, 1944, the Libbey Glass Company of Toledo, Ohio, and the Owens-Illinois Pacific Coast Company will become divisions of the Owens-Illinois Glass Company, according to recent announcement by J. P. Levis, president of Owens-Illinois.

The firms, formerly operated as wholly owned subsidiaries, will be dissolved and their business conducted as the Libbey Division and the Pacific Coast Division of the Owens-Illinois Glass Company.

J. H. Wright, former president of the Libbey Glass Company, has been elected one of the new vice-presidents of Owens-Illinois and will direct various phases of the sales program, being associated with F. J. Solon, vice-president and newly appointed director of sales.

The other newly elected vice-president of Owens-Illinois is H. S. Wade, former president of Owens-Illinois Pacific Coast Company.

The Libbey Glass Company, organized in 1818 under the name of The New England Glass Company, and located at its present site in Toledo for fifty-five years, had operated as a subsidiary of Owens-Illinois since 1937. Primarily a manufacturer of table glassware, the plant now is engaged largely in war work.

The positions of William E. Levis, chairman of the board; C. B. Belknap, vice-chairman of the board; Preston Levis, president; C. R. Megowne, vice-president and comptroller; and J. H. McNerney, secretary-treasurer will be unchanged under the new arrangements.

1944 GLASS CONTAINERS AND CLOSURE QUOTAS ANNOUNCED

New L-103-b includes both glass containers and closures. Order temporarily retains original beverage container provisions.

Late in the first week of January, WPB issued its long awaited "Supplementary Order" L-103-b. First feature to challenge attention is the fact that the new order contains the quotas for both glass containers *and* closures—a welcome innovation and one that is highly logical, since both items are used together. Formerly, closure quotas were handled in a separate order, M-104.

Perhaps next in importance is the change in base period. Except for coffee, the base year for all products is uniformly 1943. This has the result in most cases of permitting in 1944 the same usage of glass as in 1943. It will be recalled that 1943 was a year of only partial restriction for glass; during the first six months its use was not covered by any limitation order. This, taken in conjunction with the fact that 1943 was the year of maximum glass container production, should provide the most satisfactory averages for the vast majority of products, and is particularly helpful to cosmetics and household chemicals. Many products, moreover, had not been packed in glass prior to 1943, and a quota based on any previous period would have given them no quota whatever.

It may be stated that while the liberal features of the revised order offer distinct advantages to the glass container industry, some glassmen are inclined to believe that production facilities may be inadequate to meet eventual glass container requirements.

Gallon and half-gallon containers are one of the few exceptions to the policy of liberalization. Their use is limited, simply because they cannot be made in sufficient quantities.

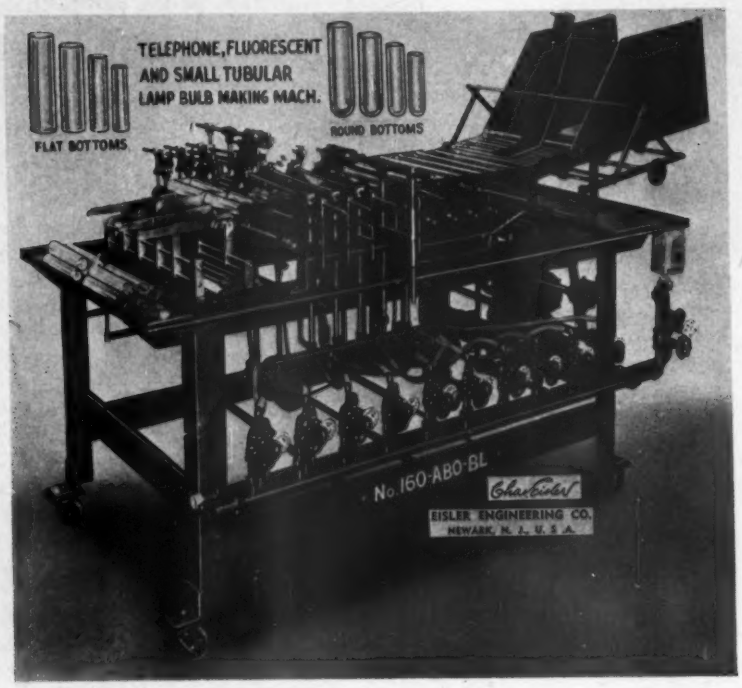
Turning to the closure sections of the order, a liberalization in the use of metal has been effected for several products. Prime metal has been allowed to such products as coffee, cosmetics, distilled spirits and wines.

Beverage crown quotas have been increased. Zinc caps are permitted for the first time on home canning closures. Restricted use of aluminum is permitted for the closures of certain drug products.

The fact that glass containers, closures and cans (M-81) have all been integrated into one unified container program will prove of incalculable value.

NEW EQUIPMENT AND SUPPLIES

GLASS TUBE BOTTOMING MACHINE



The Eisler Engineering Company of Newark, N. J., recently announced its production of a new glass tube bottoming machine with improved features and wider range of work.

The above illustration shows the machine: The glass tubing, cut to double required length, is placed into the mechanically agitated feeder and then forwarded piece by piece. The tubes carried automatically in forward direction, and at the same time kept continually in rotation about their own axes by rollers underneath, pass an arrangement of gas burners which preheat the place of the tubing where a flat or round bottom has to be formed. Additional small rollers are provided pressing slightly on top of the tubing to hold them in proper position during the following operation of bottoming. The number of these burners depends on the outside diameter, the wall thickness and quality of the tubing. After preheating, a special cut-off burner divides the glass tubing in two pieces.

The flat bottom is then made by pressing the cut tubes gently against a preheated steel plate, called Bottomer. A special device, combined with a properly shaped mould, inserted in place of the formerly used steel plate, is employed, when round bottoms are required.

After the bottom forming is accomplished a glazing process starts by employing a series of appropriate burners for smoothing the sharp edges at the open end of the tubes. Subsequently, a cooling off position is supplied before the finished double tubes are automatically discharged and delivered to a shelf. The whole mechanism, including the manifold for gas, air and oxygen, is mounted on a solid, welded and reinforced table structure of 90″ x 40″.

Each burner has a separate needle valve and mixer for setting the adequate fire. This type of machine, driven by a ½ HP motor, is adjustable for handling tubes in the range of 4″ to 10″ length and ¼″ up to 2½″ outside diameter. The production depends on the size of work and is approximately between 800 to 500 pairs of vials per hour. The required pressure for gas is 2½ to 3 pounds, for air 1 to 2 pounds and for oxygen 2 pounds per square inch.

The vials are employed for manufacturing switchboard lamps, fluorescent starters, miniature surgical lamps, small electronic tubes, hearing aid tubes, medicinal vials, test tubes and small tubular bulbs of all kinds.

NEW X-RAY UNIT FOR INDUSTRIAL PLANTS AND LABORATORIES

The new Electronic Searchray, produced by the North American Philips Company, Inc., of Dobbs Ferry, New York, is a simple, compact X-ray unit which allows safe, rapid inspection of small parts, assemblies, moulds and castings of light alloys, ceramics, and similar products in the factory and laboratory.

The important advantage of this electronic tool is that it permits the inspection of internal components which are ordinarily concealed from view.

The Searchray can be easily operated by unskilled personnel and no elaborate or expensive tools are required, either for its operation or installation.

AIDE TO GLASS DRILLING

A new product called Sinszine has recently been developed by E. Karelsen, Inc., of New York City, producers of Diamond Cutting Tools. It is an aide to those operators who must do accurate, careful and rapid drilling in glass.

Four properties are claimed by the manufacturer for this product — one which assures rapid, smooth cutting; another which lubricates and gives greater life to the Tool; a third which is a cooling agent for the Tool; and a fourth which prevents smears or a greasy deposit.

CATALOGUES RECEIVED

Metropolitan Life Insurance Company, New York, N. Y. "Safeguarding the Woman Employee" brings to the fore the problem of educating women workers in industrial plants and factories in safe working methods.

General Electric Company, Schenectady, N. Y. A recent bulletin from this company describes the G-E Cabinetrol, a new simplified system for providing motor control for complex industrial processes. The publication also lists the uses of the Cabinetrol and explains in detail how the equipment is manufactured.

The Clipper Manufacturing Company, St. Louis, Mo., has just released some especially attractive brochures explaining the use of their Masonry Saw. Emphasis is placed on the speed with which the saw accomplishes its job and the many materials which may be cut with it. This saw has been used to equal advantage by glass plants, steel mills, chemical companies and refractory manufacturers.

CATALOG & BULLETIN SERVICE

Current catalogs and manufacturers' service bulletins reviewed in this department may be obtained by writing to THE GLASS INDUSTRY.

Automatic controls make the SC furnace a precision tool in the hands of the glassmaker.

Such innovations as full automatic control of the time-temperature cycle and controlled recirculation of the lehr atmosphere make it possible to impart new qualities to glass, to create many new wartime applications.

Concentrating now on war problems, we are also mindful of post-war needs. We expect the lessons taught by war to help us better serve you in peace. So consult SC engineers when you plan for efficient, economical production—today and tomorrow. Surface Combustion, Toledo, Ohio.

Wherever Heat is Used in the Glass Industry

Surface Combustion

LEHRS • KILNS • RECUPERATIVE TANKS • HEAT TREATING FURNACES

ALSO INDUSTRIAL FURNACES, JANITROL GAS-FIRED SPACE HEATING EQUIPMENT AND KATHABAR MOISTURE CONTROL SYSTEMS

GA12

INVENTIONS AND INVENTORS . . .

(*Continued from page* 27)

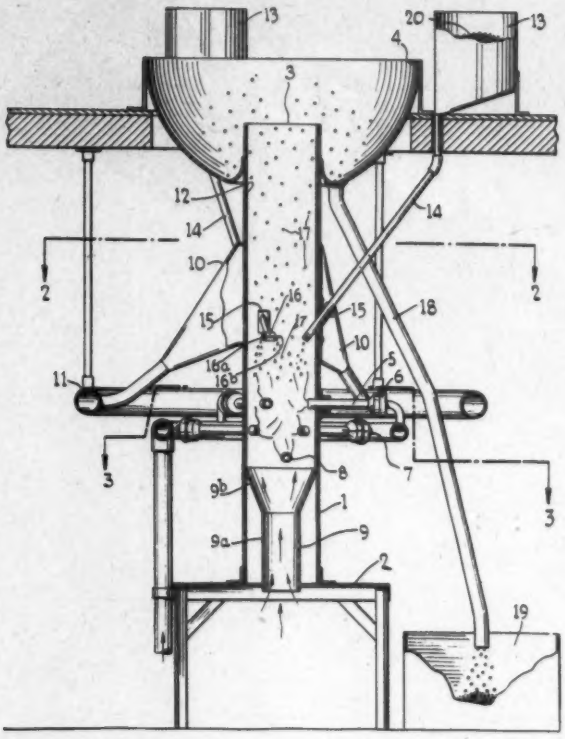
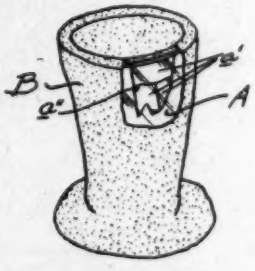


Fig. 4. 2,334,578: Potters. Tiny glass beads for coating movie projection screen are made by fusing ground glass particles in air and then removing them by air blast.

Eugene Schwarz of Alexandria, Ind. (The Mantle Lamp Co. of America), received patent 2,333,745 for a method of making long pressed glass pedestals such as might be used for lamp standards.

Miscellaneous Processes



A. M. and Eugene Landesman of St. Louis describe in patent 2,333,186 a method of repairing broken glassware. As shown in Fig. 5 the pieces are assembled and the article is coated inside and out with a molding composition about a quarter-inch thick. The only part left bare is the outer surface at the lines of fracture. Next, the article is heated to the annealing range and flame is applied to the fracture lines to cause the mending to occur by fusion. The molding composition preferred is a fine powder composed of 25 parts plaster of paris, 74 parts silica, 0.8 parts common salt, and enough water to form a paste.

Fig. 5. 2,333,186: Landesman. To repair a broken article it is coated with a plaster, heated to an annealing temperature and a flame is applied to refuse the fracture lines.

Apparatus for burning the moil from tumblers is described in patent 2,334,111 granted to W. L. McNamara and M. O. Combs of Lancaster, Ohio (Anchor-Hocking Glass Corp.) The order of steps performed and their nature is designed to separate the moil by heating the line of separation until the moil can be twisted from the tumbler, and to cause the separation with a minimum of teardrops on the finished rim. In the view of Fig. 6 the glass has just been heated to the condition which allows the chucks which hold the ware, to begin their opposing rotation so as to bring about severance. This is a turret type machine supporting many articles for successive treatment.

D. G. Merrill of West Hartford, Conn. (Hartford-Empire Co.) received another patent 2,335,128 for a tunnel lehr with various controlled zones.

Sheet and Plate Glass

For two successive months the number of patents issued on sheet glass has fallen to the lowest level in years. However, two were issued to Libbey-Owens-Ford Glass Co. in 2,334,651 to C. B. Schafer, and 2,334,624 to C. D. Haven, and J. J. Hopfield, all of Toledo. The first of these describes apparatus for washing curved glass sheets between rotary brushes to which the sheets are fed through rollers. The latter patent concerns methods for fabricating some of the multiple glass sheet products with metallized edges which have been described in earlier patents to the same inventors.

Glass Wool and Fiber

Patent 2,333,218 for glass fiber manufacture was issued to G. von Pazsicky of Hamburg, but is vested in the Alien Property Custodian for free licensing to American industry, along with other inventions of Pazsicky's. Glass is fed to a rotating vertical tube which has horizontal branches from which fibers are blown due to the blast of air issuing from central ducts concentric with the apertures. The fibers are collected by conveyors and finally accumulated on a horizontal belt.

The group of Owens-Corning Fiberglas patents issued in November includes 2,335,135 to Carl G. Staelin,

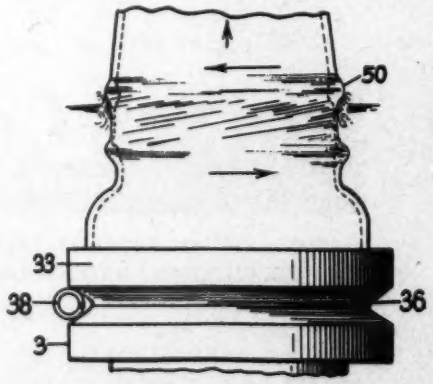


Fig. 6. 2,334,111: McNamara and Combs. At this stage in removing the moil from a tumbler the bead is forming and the chuck holding the moil has begun the counter revolution which will result in severance.

(*Continued on page* 37)

THE MEYERCORD CO.

PRESENTS THE

Sans-Art Salon

DESIGNED AND EXECUTED BY

MARSHALL FIELD & CO.

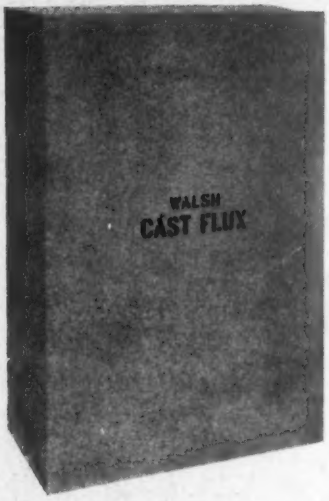
EXHIBITION OPENS JANUARY 17, 1944

ROOM 2354 • AMERICAN FURNITURE MART

A permanent exhibit featuring modern furniture and accessories fashioned with Meyercord's lacquer veneers. This stylized presentation marks 50 years of Meyercord service to the furniture industry. We invite you to inspect this display of new functions, new and unusual applications which illustrates the designing and production flexibility of Meyercord's lacquer veneers.

CHICAGO FURNITURE SHOW • JANUARY 17 TO 28

WALSH CAST-FLUX



The Vacuum-cast flux block of superior quality.

Walsh Cast-Flux blocks are machine-trued to exact size and shape after burning.

THEY LAST LONGER

The excellent results obtained in numerous tanks melting various types of glass has definitely established the efficiency and economy of Walsh Cast-Flux blocks.

Walsh Cast-Flux has a dense, uniform structure; it is burned at higher temperatures, is thoroughly bonded and possesses a low coefficient of expansion.

Walsh Cast-Flux blocks meet the most rigid requirements for tanks operating at higher temperatures . . . they insure greater tonnage, higher quality glass, freedom from defects, longer life and maximum economy.

WALSH REFRACTORIES CORPORATION

Manufacturers of Refractories for the glass industry for over 50 years

4428 North First Street

St. Louis Missouri

THE SHARP-SCHURTZ COMPANY

CHEMISTS AND CONSULTING ENGINEERS

FOR THE GLASS INDUSTRY

LANCASTER, OHIO U. S. A.

GLASS SPECIALTIES

Transparent Colored Blown Sheet Glass
Solid Pot Opal Blown Sheet Glass
Flashed Opal Blown Sheet Glass
Colonial Antique Colored Glass
Heat-Ray Resisting (Cool Glass)
"TWIN-RAY" — the scientific illuminating glass.

HOUZEX

L. J. HOUZE
CONVEX GLASS CO.
Point Marion, Pennsylvania
New York Office: 110 West 40th St.
Chicago Office: 1597 Merchandise Mart
"IF IT'S MADE OF GLASS, ASK US FIRST"

I WAS CUT IN 5 SECONDS WITH A CLIPPER

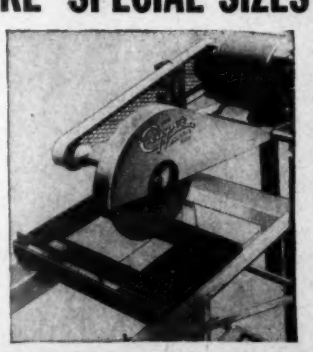
Yes... YOU CAN CUT SILICA BRICK IN 5 SECONDS WITH A CLIPPER MASONRY SAW

'TAILOR-MAKE' SPECIAL SIZES

THE SPEED AND ECONOMY IS AMAZING!

You can easily cut any masonry material with Clipper Masonry Saws . . . Clay, Concrete, Magnesite, Sillimanite or Acid Resistant Brick.

Write for latest Catalog.



CLIPPER MANUFACTURING CO.
4009 MANCHESTER ST. LOUIS, MO.

INVENTIONS AND INVENTORS . . .
(*Continued from page* 34)

2,333,267 to Piero Modigliani, and 2,335,102 to W. M. Bergin and A. L. Simison. The first of these describes a method of drawing fibers from a melting tank through a bushing which has many apertures arranged in tiers and concentrically, so that the form is that of an inverted cone. The Modigliani patent is a division of his patent 2,265,186 granted in December 1941. In this latest one he makes strands by the use of a spinning drum carrying a mat of fibers, and having a number of cutting knives placed around it for cutting the mat into a number of strips which are then stretched as they are drawn from the drum to form strands. The Bergin-Simison patent tells of the manufacture of a light weight wool bat bonded with about 0.5 to 2.5 per cent of a thermosetting stiffening agent such as Bakelite, with similar amounts of a fatty acid or soap such as stearic or oleic acid to act as an emulsifier, and a compatible oil such as mineral oil. The patent is directed to the method of depositing the fibers, applying the bond and oil, and finally applying heat to set the resin.

WAR CONFERENCE ON INDUSTRIAL AND COMMERCIAL GAS

The 1944 American Gas Association War Conference on Industrial and Commercial Gas will be held at Hotel Seneca, Rochester, New York, on March 30 and 31, according to announcement made by the Industrial and Commercial Gas Section.

Many lessons have been learned through handling the problems arising in applying industrial gas to higher speed, higher quality and greater quantity production in war plants and these lessons will be thoroughly analyzed and discussed at the Conference and interpreted in terms of better industrial gas utilization in the future. Postwar plans in the industrial and commercial gas fields will also be featured at the Rochester Conference.

PERSONNEL CHANGES AT PITTSBURGH PLATE GLASS

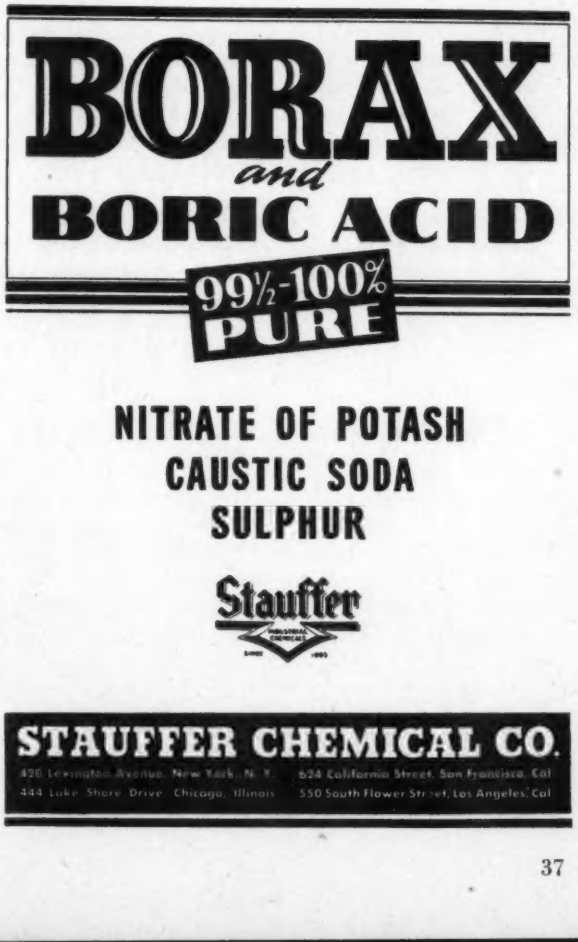
According to a recent announcement from the Pittsburgh Plate Glass Company the following changes in executive personnel will become effective as of January 1, 1944: Clarence M. Brown has resigned as chairman of the board of directors, but will remain active on the executive committee, on the board, and as chairman of the finance committee. Harry S. Wherrett, now vice chairman, will become chairman of the board. Robert L. Clause, now president, will become vice chairman of the board, and Harry B. Higgins, now executive vice president, will become president.

GLASS LAMP PARTS ANNOUNCED AS ESSENTIAL

According to a recent announcement by the War Manpower Commission the manufacture of kerosene lamps, glass lamp chimneys, lantern globes, lamp bases and accessories, as well as vacuum bottles, are considered as essential industry.

Therefore, the personnel in a glass plant engaged in the manufacture of these items are now recognized as employees in essential industry.

all the colors of the RAINBOW
for color come!
WE have over a million color formulae in our files. These colors have been developed over a period of many years and their constant uniformity has given HOMMEL COLORS the enviable reputation as Leaders in the Field.
HOMMEL has maintained COLOR LEADERSHIP by • Pioneering in the development of new materials and manufacturing methods • Prompt shipment of orders • Complete modern manufacturing facilities • Maintaining the largest stock of colors and oxides in the world • Over 50 years of Ceramic experience • Strict laboratory control of raw materials used in color manufacturing • Prompt service from Hommel's experienced Service Engineers.
• Send your next color order to HOMMEL and let us justify our claims to you.
THE O. HOMMEL CO.
209 Fourth Avenue Pittsburgh, Penna.



Left to Right: W. D. Dugan, W. H. Mandeville, and F. B. Pollock.

ELECTION OF OFFICERS HELD AT THATCHER MANUFACTURING COMPANY

At a meeting of the Thatcher Manufacturing Company held on December 22nd new officers were elected and the board of directors received the resignation of Emory G. Ackerman as chairman of the board. According to the company's announcement Mr. Ackerman's resignation was effective as of that date. He had been president of the firm until December 15th at which time Franklin B. Pollock of New York City was elected president.

Other officers elected were as follows: Attorney William H. Mandeville, vice president and chairman of the executive committee; F. K. Rodewald, vice president and assistant to the president; George Dusterdieck, vice president in charge of sales; Walkerman D. Dugan, vice president in charge of plant operations; Putnam Neil of New York, vice president in charge of the New York office, and Whitney S. Powers, secretary and treasurer.

Mr. Pollock, the new president, was formerly vice president of the Olean Glass Company, a subsidiary of the Thatcher Manufacturing Company. Effective January 1st, the name of the Olean Glass Company will be discontinued and all operations will be under the name of the former parent company.

NEW ASSISTANT MANAGER AT WESTINGHOUSE

James H. Jewell has just been appointed assistant manager of Industry Departments at the Westinghouse Electric and Manufacturing Company, according to announcement by that company. Since 1940 Mr. Jewell has been manager of the company's Agency and Specialties Department and will continue to head that division.

NEW REPRESENTATIVE FOR WALSH REFRACTORIES

Walsh Refractories Corporation, St. Louis, announces that Fred T. Sandblade has just been appointed as their district representative in the Pittsburgh territory.

Mr. Sandblade will handle the sale of their line of Glass House Refractories, high temperature cements and other refractory specialties that this company produces for the glass industry.

BUY WAR BONDS
NATIONAL THRIFT WEEK
JANUARY 17-23

PRESTON LABORATORIES . . .

(*Continued from page* 20)

sell T. Norris, chief biologist, and Marcus L. Basham, chief electrician and optical glass worker. The most recent addition to the staff is Professor Eugene F. Poncelet, a graduate of the University of Liege, Belgium. Professor Poncelet will continue to devote his researches to rock cracking, ore-dressing and glass fracturing.

No story of the Preston Laboratories would really be complete without some mention of the diversions of Dr. Preston and staff. Of striking interest is the collection of pheasants of many varieties from all parts of the world, peacocks, raccoons and other wild life. These have all been provided with proper lodgings by virtue of the spacious grounds. The "Norris Dam" (Russell T., chief biologist), the "McCormick Dam" where the wild fowl stop off on their migrations, and many other natural and man made (Preston) objects of interest, all contribute to life at this unique laboratory where so much serious work is being done high in the Allegheny Hills.

Peacock on display, one of the many beautiful specimens in the Preston "aviary."

PRESIDENT OF MATHIESON ALKALI RETIRES

G. W. Dolan

The Mathieson Alkali Works, Inc., announces the retirement of E. M. Allen, president, effective January 1, 1944. He will continue in his office as chairman of the Board of Directors of the Company. Mr. Allen became president of the company in 1919 and since 1938 has been chairman of the Board, and president.

Mr. G. W. Dolan, former executive vice-president of the Company, has been elected Mr. Allen's successor. Mr. Dolan has been with the organization since 1930 and has held the position of executive vice-president since 1941.

Announcing

TWO NEW SQUEEGEE OILS WITH 8 IMPORTANT ADVANTAGES

DRAKOLENE
No. 175
for single color prints or for blending two or more colors in a single design.
DRAKOSETT
No. 176
for use when one color is to be superimposed over another.

● For a long time Drakenfeld technologists wrestled with the problems which confront manufacturers who do screen printing on glass. Defects such as color that does not print sharp, color that runs, clogged screens, damaged screens, disturbing oil fumes, bleeding of superimposed colors — all were studied and analyzed again and again.

As a result of this important research in color application, Drakenfeld now offers you two new production-tested squeegee oils—Drakolene No. 175 and Drakosett No. 176—which overcome these causes of inferior printing and costly rejects.

Learn what these new color vehicles can do to save time and money, and increase your salable production *Try them*. Because their working characteristics differ slightly from those of old-time squeegee oils, we invite you to have one of our technologists present during your test run. Write today for samples and an appointment timed to suit your convenience. You will not be obligated in any way.

B. F. DRAKENFELD & CO., INC., 45-47 Park Pl., New York 7, N. Y.
Factory and Laboratories: Washington, Pa.

Pacific Coast Agents: Braun Corp., Los Angeles 21—Braun-Knecht-Heimann Co., San Francisco 19

Drakenfeld Squeegee Oils Give You These 8 Important Advantages

1. Fire without blistering or carbon retention.
2. Print extremely sharp and *stay* sharp while drying, even in small lettering.
3. Smooth surface flow leaves printed color which will not run or sag, even when thin paste is used.
4. Eliminate screen marks—therefore colors fire with smoother finish, resulting in greater gloss.
5. No preliminary color drying necessary—small quantities of moisture do not affect workability.
6. Freedom from prime "critical" ingredients.
7. No obnoxious odor to make workers uncomfortable.
8. May be used under a wide range of operating conditions.

DRAKENFELD

YOUR PARTNER IN SOLVING COLOR PROBLEMS

GLASS INSPECTION
with the *Polaroid*

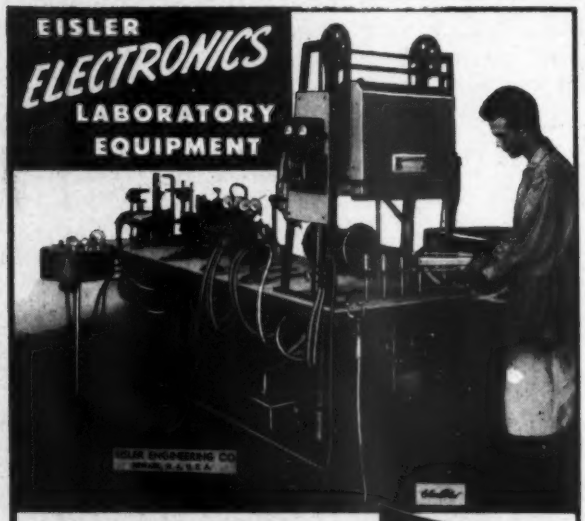
Spectacle type polariscope

THE polarizing spectacle, mounted in unit with sensitive tint plate of 565 millimicrons, presents an absolutely uniform field of large aperture, strains showing up in sharply defined and correct colors.

Standard size apertures are 6" diameter and 12" diameter, and a rectangular size of 8" x 16"; but any special size to meet your requirement can be made. The 6" unit is suggested for either plant inspection uses or — as a portable unit for the trouble shooter or the salesman where a large aperture, compact unit of light weight is desirable.

The POLARIZING INSTRUMENT CO., Inc
1819 Broadway **New York City, 23**

EISLER
ELECTRONICS
LABORATORY
EQUIPMENT



This electronic tube making unit fills the needs of schools, colleges, experimental and research laboratories for a compact machine complete in itself and capable of performing all operations required in the construction of incandescent lamps, radio tubes, electronic tubes and similar devices.

WRITE FOR CATALOG No. 43-B

CHAS. EISLER
EISLER ENGINEERING CO.
742 SO. 13th ST. 750 AVON AVE. NEWARK 3, N. J.

READY-TO-SET GLASS VEE JEWELS

General Electric Company is now offering vee jewels which are ready to set instead of their previous run-of-mill quality. Before jewels are shipped, they are examined under a binocular microscope, which has a magnification of 40 diameters, for incipient flaws in the glass, the depth of the vee and its concentricity. Simultaneously the bearing is explored for pits or roughness with a fine steel needle.

Since the beginning of the war glass vee jewels have been manufactured in tremendous quantities to replace imported sapphire jewels which are now practically unobtainable. The jewels have the same coefficient of friction as the sapphire and in combination with instrument steel pivots, under vibration, they often produce less friction increase than does the sapphire.

MINIMUM WAGE RATE DECREE FOR GLASS AND ALLIED INDUSTRIES

The Wage and Hour Division of the United States Department of Labor has issued a Decree affecting wages for workers in Glass, Stone, Clay and Allied Industries. According to this decree on and after December 27, 1943, wages for employees in these industries, engaged in the production of goods for commerce, are to be at the rate of not less than 40 cents per hour.

The Wage and Hour Division will send notices to this effect to all companies within the next four weeks and when these are received employers are to post notices in each department concerning the decree.

NEW APPOINTEE ON STAFF OF BATTELLE MEMORIAL INSTITUTE

The Battelle Memorial Institute, Columbus, Ohio, recently announced the addition of Norman L. Haldy, ceramic engineer, to the staff in the division of ceramic research.

Mr. Haldy was formerly associated with the Walker China Company in Bedford, Ohio. He is a member of the American Ceramic Society.

MICROANALYTIC METHODS . . .

(*Continued from page 22*)

acid. The dry residue is shortly heated with an addition of one drop concentrated hydrochloric acid and 5 cc. distilled water and under the addition of two drops hydrofluoric acid. The mixture is then decanted, filtered through a fine filter and the filter is washed well with 1:20 nitric acid. The filter is then returned into the crucible and combusted therein. The ash then is melted with potassium pyrosulfate and then one proceeds as described above. To reduce the unavoidable losses on filtration thorium nitrate may be added to the glass sample; thus the cerium will be distributed in the thorium precipitate and the losses in cerium precipitate reduced. Not more than five milligrams of thorium nitrate in solution should be added. This method allows detection of down to 40 gammas cerium in the presence of 6 to 10 milligrams iron, manganese, cobalt or nickel.

If iron is the only interfering ion the first described method may be modified as follows: Prior to the addition of ammonia and hydrogen peroxide a few crystals of tartaric acid may be added to prevent precipitation of ferrous hydroxide by the formation of a complex iron salt. Addition of tartaric acid may be helpful in any of the described methods, too large additions, however, should be avoided so as not to reduce the sensitivity of the reaction.

GLASS OVERCOATS FOR STORAGE BATTERIES

Glass overcoats are the latest thing in keeping storage batteries in working order in Army motorized equipment operating on the Alaska Highway and in the Aleutians.

The Mid-West Fiberglas Fabricators, Detroit, Michigan, is now insulating the steel-box battery holders with one-half-thick boards composed of bonded glass fibers in order to prevent battery acids and distilled water from freezing when the temperature is as low as 40 below zero.

The glass fiber board used is manufactured by Owens-Corning Fiberglas Corporation and was selected as the insulating material after tests in the motor manufacturer's cold room.

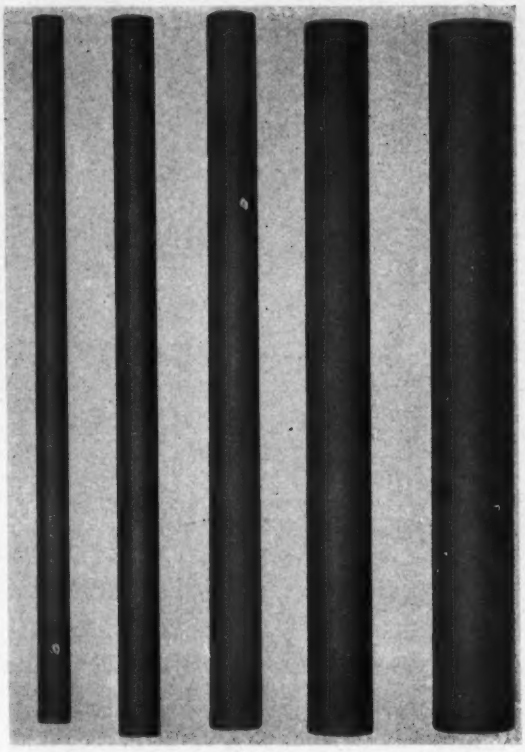
Since extremes of temperature, both high and low, affect the performance and life of storage batteries in all types of motor vehicles, it is believed that Army experience with insulated batteries may lead to a similar development for postwar civilian use.

WICKWIRE SPENCER STEEL APPOINTS NEW GENERAL SUPERINTENDENT

Robert T. Dunlap has just been appointed as General Superintendent of the Buffalo Works of the Wickwire Spencer Steel Company.

Mr. Dunlap is well known in the steel industry as an authority on plant installations, production and operation. Before joining the staff of Wickwire Spencer he served as General Works Manager for the Vulcan Iron Works at Wilkes-Barre, Pennsylvania. He has also been associated with the Elliott Company of Jeanette, Pennsylvania; Jones & Laughlin Steel Corporation of Pittsburgh, and the Pittsburgh Bridge and Iron Works.

Malleable Iron Rods for plugging Moulds



3/16" 1/4" 5/16" 3/8" 1/2" 5/8" x 6"

IN the manufacture of Malleable Rods a "white iron" is produced Fe3C. The carbon is present in the combined form. The "white iron" castings are annealed or graphitized so that the final structure consists of ferrite (Fe) and free carbon (C) which is in the form of "temper" carbon.

This material is very soft and will pein readily.

Machinability

It is generally known, in commercial operations, Malleable iron machines more readily than other ferrous materials of equal tensile properties.

May we send you a descriptive booklet or answer questions on your specific problems?

Price of 15c *each F.O.B. Rockford*

GUNITE FOUNDRIES CORPORATION

ROCKFORD ILLINOIS

Established 1854